REMARKS

Reconsideration and allowance of the present patent application based on the foregoing amendments and following remarks are respectfully requested.

By this Amendment, claim 23 is amended. Claims 1-22, 33 and 34 are withdrawn from consideration as being directed to non-elected inventions. After entry of this Amendment, claims 1-34 will remain pending in the patent application.

As a preliminary matter, Applicants note that the Office Action withdrew claim 34, which was presented in Applicants' Amendment dated August 5, 2005. However, claim 34 depends from claim 25 and is therefore part of species (ii), which was elected with traverse by Applicants. Accordingly, it is respectfully requested that claim 34 be treated on the merits in the next communication from the Office.

Claims 23 and 25 were rejected under 35 U.S.C. §103(a) based on Hsu *et al.* (U.S. 2003/0044722) (hereinafter "Hsu") in view of Almogy (U.S. 2003/0123040). The rejection is respectfully traversed.

Claim 23 recites a device manufacturing method comprising, *inter alia*, providing a substrate coated with a photoresist layer having reduced memory reaction characteristics and providing a beam of radiation. As conceded by the Examiner on page 4 of the Office Action, Hsu does not disclose, teach or suggest a photoresist layer with reduced memory reaction. However, Applicants respectfully submit that there are additional features that are absent in Hsu.

For example, Hsu fails to disclose, teach or suggest a method comprising, *inter alia*, employing a patterning device to impart said beam of radiation with a pattern in its cross-section in which said pattern is decomposed into at least two constituent sub-patterns; exposing a first of said at least two constituent sub-patterns by directing said beam of radiation through said first sub-pattern such that said lithographic system produces a first sub-pattern image onto a target area of said pre-specified photoresist layer of said substrate; processing said exposed substrate; exposing a second of said at least two constituent sub-patterns by directing said beam of radiation through said second sub-pattern such that said lithographic system produces a second sub-pattern image onto said target area of said pre-specified photoresist layer of said substrate, wherein said exposing of the first of said at least two constituent sub-patterns and said exposing of the second of said at least two constituent

sub-patterns combine said first and second sub-pattern images to produce a desired pattern on said target area of said substrate.

Hsu merely discloses a double exposure process to reduce CD bias of a desired pattern between the center and the edge of the substrate. (*See* paragraph [0010]). Specifically, Hsu discloses exposing the center of the substrate with a desired pattern using a first lithographic parameter, developing and etching the desired pattern produced with the first lithographic parameter, exposing the edge of the substrate with the same desired pattern using a second lithographic parameter, and then developing and etching the desired pattern produced with the second lithographic parameter. (*See* paragraph [0013]).

However, unlike claim 23, Hsu is silent as to employing a patterning device to impart a beam of radiation with a pattern in its cross-section in which the pattern is decomposed into at least two constituent sub-patterns. Hsu merely discloses exposing a same desired pattern onto the substrate.

Furthermore, unlike claim 23, Hsu is silent as to exposing a first of the at least two constituent sub-patterns by directing the beam of radiation through the first sub-pattern such that the lithographic system produces a first sub-pattern image onto a target area of the pre-specified photoresist layer of the substrate, processing the exposed substrate, and exposing a second of the at least two constituent sub-patterns by directing the beam of radiation through the second sub-pattern such that the lithographic system produces a second sub-pattern image onto the target area of the pre-specified photoresist layer of said substrate. Thus, in contrast to claim 23, Hsu merely discloses exposing the same desired pattern onto different target portions of the substrate. (*See* paragraph [0013]).

Almogy fails to remedy the deficiencies of claim 23. Almogy merely discloses using a maskless high resolution and high data rate spot grid array printer system in combination with memoryless photoresist in order to suppress side-lobe formation on the substrate. (*See* paragraphs [0013]-[0014]).

Therefore, any reasonable combination of Hsu and Almogy cannot result in any way in the invention of claim 23.

Furthermore, Applicants respectfully submit that there is no motivation or suggestion to combine the cited references for at least the following reasons.

First, the Examiner alleged in paragraph [0004] of the Office Action that "it would have been obvious to one of ordinary skill in the art to modify the photoresist layer of Hsu by including a memoryless photoresist for at least the purpose of avoiding integrating the

energies of consecutive exposures." However, Applicants respectfully submit that the reason provided by the Examiner for the suggested combination lacks merits and that this *post hoc* justification for the asserted modification is clearly based on an improper application of hindsight based on Applicants' own specification.

Thus, there is no indication that Hsu would suffer from integrating the energies of consecutive exposures. To the contrary. Hsu discloses that after exposing the center of the substrate, the substrate is developed and the first resist exposed with the first lithographic process is stripped. (*See* FIG. 3). As such, since the first resist cannot be exposed with the second lithographic process, there cannot be any concern about integrating the energies of consecutive exposures. Therefore, there is clearly no motivation to use a memoryless photoresist in Hsu, as suggested by the Examiner.

Second, Hsu discloses forming a desired pattern onto a substrate with a mask/patterning device using a first and a second exposure process to reduce CD bias between the center and the edge of the substrate. By contrast, Almogy discloses using maskless lithography to improve resolution of the imaged pattern. (*See* paragraph [0006]). However, by virtue of teaching that masks/patterning devices have become increasingly difficult and expensive to make and that it is desirable to provide a practical, maskless direct write system with improved resolution and throughput for improved lithography, Almogy teaches away from the lithographic process of Hsu. (*See* paragraphs [0006] and [0010]). As such, *per* MPEP 2145, Applicants respectfully submit that it would not have been obvious to combine the teachings of these references.

Therefore, for at least these reasons, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness.

Claim 25 is patentable over Hsu, Almogy and a combination thereof at least by virtue of its dependency from claim 23 and for the additional features recited therein.

Accordingly, reconsideration and withdrawal of the rejection of claims 23 and 25 under 35 U.S.C. §103(a) based on Hsu in view of Almogy are respectfully requested.

Claim 28 was rejected under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Nakamura *et al.* (U.S. 2003/0064307) (hereinafter "Nakamura"). The rejection is respectfully traversed.

Claim 28 is patentable over Hsu, Almogy and a combination thereof at least by virtue of its dependency from claim 23 and for the additional features recited therein. Namely, claim 28 is patentable over Hsu, Almogy and a combination thereof at least because this claim recites a method comprising, *inter alia*, employing a patterning device to impart said

beam of radiation with a pattern in its cross-section in which said pattern is decomposed into at least two constituent sub-patterns; exposing a first of said at least two constituent sub-patterns by directing said beam of radiation beam through said first sub-pattern such that said lithographic system produces a first sub-pattern image onto a target area of said pre-specified photoresist layer of said substrate; processing said exposed substrate; exposing a second of said at least two constituent sub-patterns by directing said beam of radiation through said second sub-pattern such that said lithographic system produces a second sub-pattern image onto said target area of said pre-specified photoresist layer of said substrate, wherein said exposing of the first of said at least two constituent sub-patterns and said exposing of the second of said at least two constituent sub-patterns combine said first and second sub-pattern images to produce a desired pattern on said target area of said substrate.

Nakamura fails to remedy the deficiencies of Hsu and Almogy. Nakamura merely discloses forming a latent image of a fine mark that is suited to alignment with a high accuracy. (*See* paragraph [0019]). Therefore, any reasonable combination of Hsu, Almogy and Nakamura cannot result, in any way, in the invention of claim 28.

Furthermore, Applicants respectfully submit that there is no motivation to combine the teachings of the references.

For example, for the same reasons provided above, there is clearly no motivation to combine the teachings of Hsu and Almogy. As such, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case of obviousness.

Accordingly, reconsideration and withdrawal of the rejection of claim 28 under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Nakamura are respectfully requested.

Claim 24 was rejected under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Amemiya *et al.* (U.S. 2002/0025019) (hereinafter "Amemiya"). The rejection is respectfully traversed.

Claim 24 is patentable over Hsu, Almogy and a combination thereof at least by virtue of its dependency from claim 23 and for the additional features recited therein. Namely, claim 24 is patentable over Hsu, Almogy and a combination thereof at least because this claim recites a method comprising, *inter alia*, employing a patterning device to impart said beam of radiation with a pattern in its cross-section in which said pattern is decomposed into at least two constituent sub-patterns; exposing a first of said at least two constituent sub-patterns by directing said beam of radiation through said first sub-pattern such that said lithographic system produces a first sub-pattern image onto a target area of said pre-specified

photoresist layer of said substrate; processing said exposed substrate; and exposing a second of said at least two constituent sub-patterns by directing said beam of radiation through said second sub-pattern such that said lithographic system produces a second sub-pattern image onto said target area of said pre-specified photoresist layer of said substrate, wherein said exposing of the first of said at least two constituent sub-patterns and said exposing of the second of said at least two constituent sub-patterns combine said first and second sub-pattern images to produce a desired pattern on said target area of said substrate.

Amemiya fails to remedy the deficiencies of Hsu and Almogy. Amemiya merely discloses first exposing an image of the first mask pattern on a portion of the substrate with an exposure dose that is below the exposure threshold, second exposing an image of a second mask pattern on the portion of the substrate with an exposure dose that is below the exposure threshold and then processing the substrate after the first and second exposures. (*See* paragraph [0049]). Therefore, any reasonable combination of Hsu, Almogy and Amemiya cannot result in any way in the invention of claim 24.

Furthermore, Applicants respectfully submit that there is no motivation to combine the teachings of the references.

For example, for the same reasons provided above, there is clearly no motivation to combine the teachings of Hsu and Almogy. As such, Applicants respectfully submit that, for at least these reasons, the Examiner has failed to establish a *prima facie* case of obviousness.

In addition, Applicants respectfully submit that there is no motivation to combine the teachings of Hsu and Amemiya. As mentioned previously, Amemiya discloses using a first exposure dose and a second exposure dose that are below the exposure threshold, but when combined together are above the exposure threshold. In Amemiya, the substrate must be developed after the first and second exposures since each exposure is below the exposure threshold. By contrast, Hsu discloses that the substrate must be developed and etched after the first exposure so that a different exposure process can be used to expose the edge of the substrate. Therefore, the modification of one of these references in view of the teachings of the other would render that reference unsatisfactory for its intended purpose. As such, *per* MPEP 2145, there is no motivation to combine the teachings of Hsu and Amemiya.

For at least these reasons, Applicants respectfully submit that the Examiner has failed to establish a *prima facie* case that would render claim 24 obvious.

Accordingly, reconsideration and withdrawal of the rejection of claim 24 under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Amemiya are respectfully requested.

Claims 26 and 27 were rejected under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Boettiger *et al.* (U.S. Pat. No. 5,111,240) (hereinafter "Boettiger"). The rejection is respectfully traversed.

Claims 26 and 27 are patentable over Hsu, Almogy and a combination thereof at least by virtue of their dependency from claim 23 and for the additional features recited therein. Namely, claims 26 and 27 are patentable over Hsu, Almogy and a combination thereof at least because these claims recite a method comprising, *inter alia*, employing a patterning device to impart said beam of radiation with a pattern in its cross-section in which said pattern is decomposed into at least two constituent sub-patterns; exposing a first of said at least two constituent sub-patterns by directing said beam of radiation through said first sub-pattern such that said lithographic system produces a first sub-pattern image onto a target area of said pre-specified photoresist layer of said substrate; processing the exposed substrate; and exposing a second of said at least two constituent sub-patterns by directing said beam of radiation through said second sub-pattern such that said lithographic system produces a second sub-pattern image onto said target area of said pre-specified photoresist layer of said substrate, wherein said exposing of the first of said at least two constituent sub-patterns and said exposing of the second of said at least two constituent sub-patterns combine said first and second sub-pattern images to produce a desired pattern on said target area of said substrate.

Boettiger fails to remedy the deficiencies of Hsu and Almogy. Boettiger merely discloses forming a photoresist pattern with openings having inclined walls where the inclination angle can be varied in a wide range independently of the photo resist thickness. (*See* col. 3, lines 14-18). Therefore, any reasonable combination of Hsu, Almogy and Boettiger cannot result in any way in the invention of claims 26 and 27.

In addition, with respect to claim 27, the Examiner alleged that Hsu discloses the additional features recited by this claim. Applicants respectfully disagree and note that the Examiner has not considered the full limitation of claim 27. Specifically, Hsu is silent as to a process that is optimized by employing specific bake times and temperatures such that the desired pattern includes features that correspond to a half-pitch lower limit k_1 less than or equal to 0.25.

Furthermore, Applicants respectfully submit that there is no motivation to combine the teachings of the references.

For example, for the same reasons provided above, there is clearly no motivation to combine the teachings of Hsu and Almogy. As such, Applicants respectfully submit that, for at least these reasons, the Examiner has failed to establish a *prima facie* case of obviousness.

Accordingly, reconsideration and withdrawal of the rejection of claims 26 and 27 under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Boettiger are respectfully requested.

Claims 29-31 were rejected under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Rolson (U.S. Pat. No. 6,122,035). The rejection is respectfully traversed.

Claims 29-31 are patentable over Hsu, Almogy and a combination thereof at least by virtue of their dependency from claim 23 and for the additional features recited therein. Namely, claims 29-31 are patentable over Hsu, Almogy and a combination thereof at least because these claims recite a method comprising, *inter alia*, employing a patterning device to impart said beam of radiation with a pattern in its cross-section in which said pattern is decomposed into at least two constituent sub-patterns; exposing a first of said at least two constituent sub-patterns by directing said beam of radiation through said first sub-pattern such that said lithographic system produces a first sub-pattern image onto a target area of said pre-specified photoresist layer of said substrate; processing said exposed substrate; and exposing a second of said at least two constituent sub-patterns by directing said beam of radiation through said second sub-pattern such that said lithographic system produces a second sub-pattern image onto said target area of said pre-specified photoresist layer of said substrate, wherein said exposing of the first of said at least two constituent sub-patterns and said exposing of the second of said at least two constituent sub-patterns combine said first and second sub-pattern images to produce a desired pattern on said target area of said substrate.

Rolson fails to remedy the deficiencies of claims 29-31. Rolson merely discloses forming a pattern by using multiple exposure steps separated by moving the substrate with unequal stepping distances and then processing the exposed substrate after the multiple exposure steps. (*See* col. 7, lines 32-45). Therefore, any reasonable combination of Hsu, Almogy and Rolson cannot result in any way in the invention of claims 29-31.

Furthermore, Applicants respectfully submit that there is no motivation to combine the teachings of the references.

For example, for the same reasons provided above, there is clearly no motivation to combine the teachings of Hsu and Almogy. As such, Applicants respectfully submit that, for at least these reasons, the Examiner has failed to establish a *prima facie* case of obviousness.

Furthermore, the Examiner alleged on page 7 of the Office Action that it would have been obvious to modify Hsu in view of Rolson for combining the first and second sub-pattern images. Applicants respectfully disagree and note that Hsu does not combine a first and a second sub-pattern image. Hsu merely discloses exposing the desired pattern at once, but is not concerned with decomposing the desired pattern into a first sub-pattern and a second sub-pattern. Therefore, the suggested motivation for the combination clearly lacks merit.

Accordingly, reconsideration and withdrawal of the rejection of claims 29-31 under 35 U.S.C. §103(a) based on Hsu in view of Almogy and Rolson are respectfully requested.

Claim 32 was rejected under 35 U.S.C. §103(a) based on Hsu in view of Almogy, Rolson and Nakamura. The rejection is respectfully traversed.

For the same reasons provided above, claim 32 is patentable over Hsu, Almogy, Rolson and Nakamura and a combination thereof at least by virtue of its dependency from claim 23 and for the additional features recited therein.

Furthermore, Applicants respectfully submit that there is no motivation or suggestion to combine the teachings of these references.

For example, for the same reasons provided above, there is clearly no motivation to combine the teachings of Hsu and Almogy. As such, Applicants respectfully submit that, for at least these reasons, the Examiner has failed to establish a *prima facie* case of obviousness.

In addition, for the same reasons provided above, there is clearly no motivation to combine the teachings of Hsu and Rolson.

Accordingly, reconsideration and withdrawal of the rejection of claim 32 under 35 U.S.C. §103(a) based on Hsu in view of Almogy, Rolson and Nakamura are respectfully requested.

The rejection having been addressed, Applicants respectfully submit that the application is in condition for allowance, and a notice to that effect is earnestly solicited.

If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, please contact the undersigned at the telephone number listed below.

Please charge any fees associated with the submission of this paper to Deposit Account Number 033975. The Commissioner for Patents is also authorized to credit any over payments to the above-referenced Deposit Account.

Respectfully submitted,

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